

# N NEEDS DIFFERENT FOR CORN IN CONSERVATION TILLAGE SYSTEM WITH CRIMSON CLOVER

**U**SING WINTER annual legumes in conservation-tillage systems reduces soil erosion, improves soil productivity, conserves soil water, and contributes to the nitrogen (N) requirement of subsequent summer grain crops. This practice has gained limited acceptance by row crop producers but may achieve greater acceptance because of conservation compliance guidelines of the 1985 Food Security Act.

Before conservation-tillage systems can be used efficiently, more information about effective management of this system is needed. Fertilizer N is the single most expensive input for corn production, but N management practices developed for conventional corn grown in conservation-tillage systems with winter legumes. A 3-year cooperative research project by the Alabama Agricultural Experiment Station and the USDA Agricultural Research Service was designed to determine management practices for maximizing the efficiency

of fertilizer N applied to continuous corn grown in a conservation-tillage system with crimson clover.

Tibbee crimson clover was planted at the E.V. Smith Research Center in mid-October during each year (1986, 1987, and 1988) of the study. In early April, Pioneer Brand Hybrid 3320 corn was planted in 30-in. rows using strip-tillage (no-tillage with in-row subsoiling) 7-10 days after the clover was sprayed with Gramoxone®. The same plots were used during all 3 years of the study.

Ammonium nitrate at rates of 30, 60, or 120 lb. N per acre was applied to corn at planting, or 3, 6, or 9 weeks later. Since splitting N applications, or side-dressing, is recommended for applying N fertilizer on corn, split applications (1/3 at planting and the remainder 6 weeks later) of 60 and 120 lb. N per acre were also included. Corn was also grown in control plots of rye and clover without the benefit of any N application to determine the amount of N contributed by clover and used by the corn.

Based on the total amount of N taken

up by corn, the clover cover crop contributed 47, 60, and 99 lb. N per acre in 1986, 1987, and 1988, respectively. Generally, time of fertilizer application had no effect on total N uptake by corn, except in 1988 when corn exhibited a greater N uptake when the fertilizer was applied at planting.

Split applications did not result in greater N uptake in any year. Although application time did not affect the total amount of N taken up by corn, it did affect grain yield.

There was no yield benefit to split applications of N in 1987 and 1988. The single exception was in 1986, the first year in the system and a year of severe drought, when the split application of 120 lb. per acre resulted in the highest yield (133 bu. per acre). There were no other effects of N application time on grain yield in 1986; however, in 1987 and 1988, delaying N application beyond 6 weeks after planting decreased yield, table 1.

Grain yield peaked with 120 lb. N per acre in 1986 and from 30-60 lb. N per acre in 1988, table 2. The decrease in fertilizer N requirement through time correlates well with the increase in total N uptake contributed from clover with successive years in the system.

Results from this study suggest a need for modifying standard recommendations for N fertilizer application practices for nonirrigated corn grown in winter legume conservation-tillage systems on Coastal Plain soils. Nitrogen requirements of continuous corn grown in this type system decrease after the system is established due to residual effects of clover N. Split applications of N fertilizer probably will not improve N efficiency or grain yields in a winter legume conservation-tillage system because late-season N requirements are provided by the decomposing legume cover crop.

TABLE 1. EFFECT OF N APPLICATION TIME (AVERAGED OVER N RATE) ON GRAIN YIELD OF CORN GROWN IN A CONSERVATION-TILLAGE SYSTEM WITH CRIMSON CLOVER

Year	Grain yield/acre, by N app. time (weeks after planting)			
	0	3	6	9
	Bu.	Bu.	Bu.	Bu.
1986	104	104	108	109
1987	107	112	106	81
1988	124	121	119	111
Av.	112	113	111	100



TABLE 2. EFFECT OF N FERTILIZER RATE (AVERAGED OVER APPLICATION TIME) ON GRAIN YIELD OF CORN GROWN IN A CONSERVATION-TILLAGE SYSTEM WITH CRIMSON CLOVER

Year	Grain yield by N rate/acre			
	0	30 lb.	60 lb.	120 lb.
	Bu.	Bu.	Bu.	Bu.
1986	77	92	92	107
1987	68	92	103	108
1988	106	116	123	117
Av.	84	100	106	111

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